



Advisory Committee Charge and Perspective on Federal Science and Technology Investments

**Briefing to Presidential Advisory Committee
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Overview

- **Advisory Committee Charge**
 - **Executive Order**
 - **Functions**
 - **Challenges**
- **Perspective on Federal Science and Technology (S&T) Investment**
 - **Interagency Cooperation**
 - **HPCC Congressional Initiative**
 - **Today's S&T Focus**



Executive Order

- President Clinton signed an Executive Order in February
- Establishes the Advisory Committee on High-Performance Computing and Communications, Information Technology, and the Next Generation Internet:
 - Non-federal members; community representatives from research, education, and libraries; network providers; and critical industries
 - Provide the National Science and Technology Council, through the Director, OSTP, with advice and information on high-performance computing and communications, information technology, and the Next Generation Internet
 - Committee terminates 2 years from date of Executive Order, unless extended by the President
- 21 Members have been appointed, including 2 Co-Chairs



Challenges for the Advisory Committee

- **Assess:**
 - **Current federal investment and programs in high end information technologies**
 - **Plans**
 - **Progress**
- **Advise:**
 - **Pick a few topics that matter to the President, the President's Science Advisor, and the Agencies**
 - **Emphasize what matters most for the future of the United States**

Rich Relationships

Timesharing

Graphics

Networking

Workstations

Windows

RISC

VLSI Design

RAID

Parallel Computing

A few examples

CTSS, Multics, BSD
Unix
SDS 940, 360/67, VMS

Sketchpad, Utah
GM/IBM, Lucas Film
E&S, SGL

Arpanet, Internet,
Ethernet, Pup, Datakit
DECnet, LANs, TCP/IP

Lisp machine, Stanford
Xerox Alto
Apollo, SUN

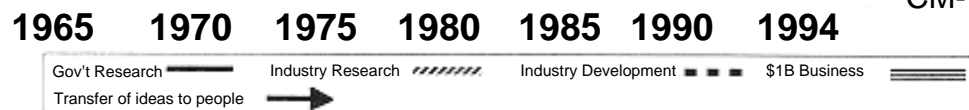
Englebart, Rochester
Alto, Smalltalk
Star, Mac, Microsoft

Berkeley, Stanford
IBM 801
Sun, SGI, IBM, HP
Mead/Conway, Mosis

Many

Berkeley
Striping, Datamesh
many

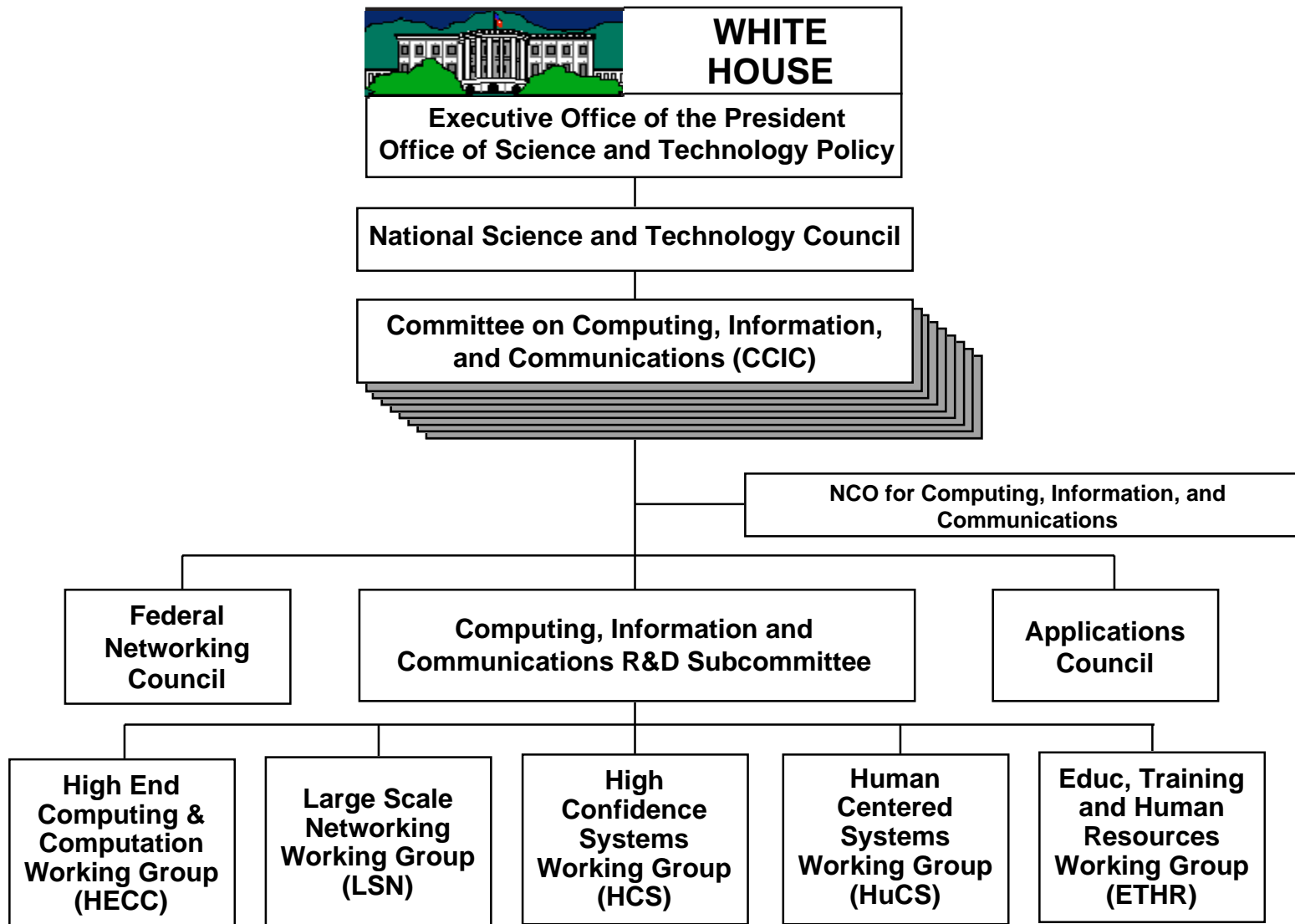
Iliac 4, C.mmp, HPC
IBM RP3, Intel
CM-1, Teradata, T3D



NRC report on "Evolving High Performance Computing and Communications Initiative to Support the Nation's Information Infrastructure," 1995, Figure 1.2



Structure for Interagency Cooperation





Participating Agencies

- Defense Advanced Research Projects Agency (DARPA)
- National Science Foundation (NSF)
- Department of Energy (DOE)
- National Aeronautics and Space Administration (NASA)
- National Institutes of Health (NIH)
- National Security Agency (NSA)
- National Institute of Standards and Technology (NIST)
- Department of Education (ED)
- Department of Veterans Affairs (VA)
- National Oceanic and Atmospheric Administration (NOAA)
- Environmental Protection Agency (EPA)
- Agency for Health Care Policy and Research (AHCPR)



Relationships

- NSTC Committees, e.g., CCIC
 - Develop overarching strategic plans to meet National goals
 - Provide oversight of Federal R&D
- CCIC Subcommittees and National Coordination Office
 - Provide a forum for interagency discussion/cooperation
 - Coordinate development of common technologies and eliminate unnecessary duplication
 - Develop critical mass across agencies
 - Expose opportunities and dependencies
- Federal Agencies
 - Meet mission goals
 - Fund and manage technical programs
 - Provide leadership in basic research and applications



Evolution of the Federal HPCC Program

- The Federal HPCC Program:
 - Chartered by Congress in the High Performance Computing Act of 1991
 - Funding authorized for FY 1992 - FY 1996 for most HPCC agencies
 - Focus
 - High Performance Computing Systems
 - Advanced Software Technology and Algorithms
 - National Research and Educational Network
 - Information Infrastructure Technology and Applications
 - Basic Research and Human Resources
 - Coordinated through the High Performance Computing, Communications, and Information Technology Subcommittee and NCO

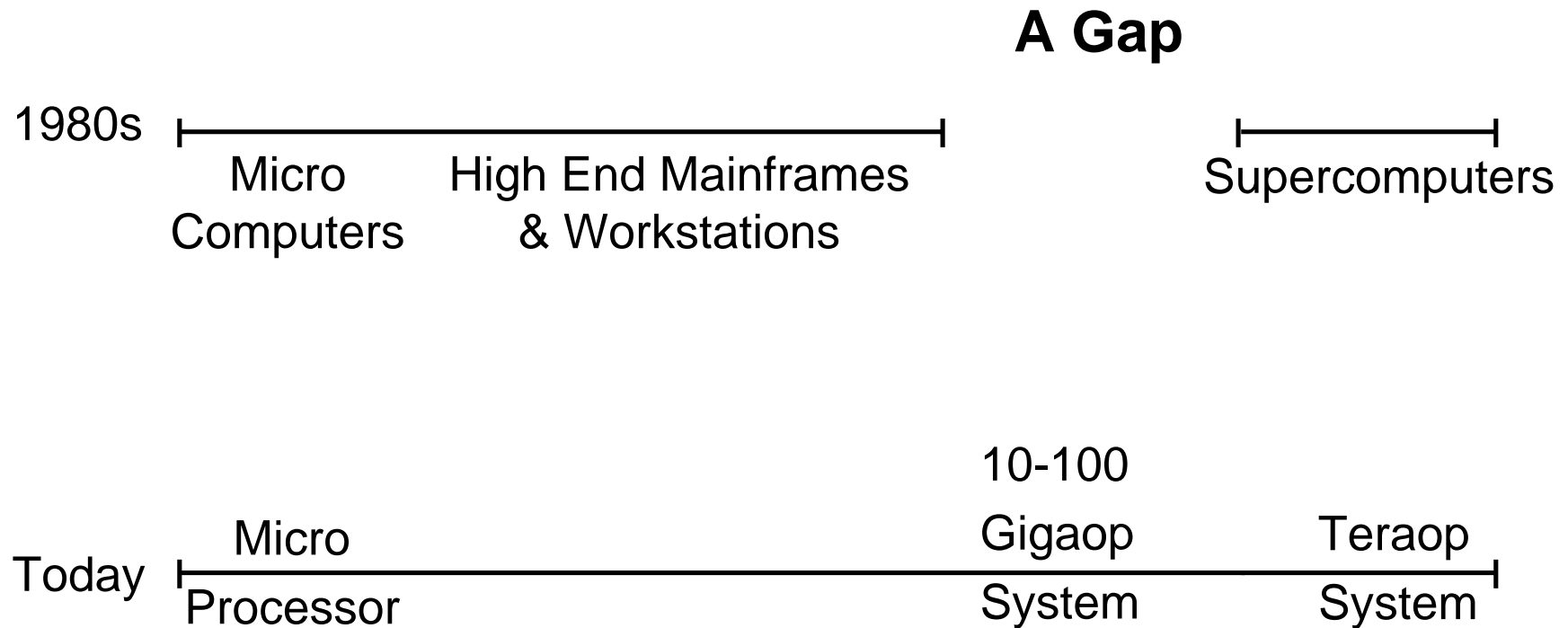


Federal HPCC Program Contributions

- Scalable parallel systems
- Enabling technologies for workstations, distributed systems
- Microkernel Operating Systems
- Internet Networking Technology
- Information Infrastructure, including early WWW Browsers
- Research for Digital Libraries
- Gigabit Testbeds
- Supercomputer Centers
- Grand Challenge Applications
- National Challenge Applications
- Mission applications: e.g., National Security, Medicine, Environment, and Education



The Spectrum of Computer Systems: 1980 vs. Today



**Scalable Machines &
Applications with
Supporting Software**



Grand Challenge Applications

- Fundamental science & engineering problem, with broad economic & scientific impact, whose solution can be advanced by applying high performance computing techniques & resources
- Involve large scale simulation, multi-disciplinary teams
- Examples:
 - Drag Control
 - Realistic Ocean Model
 - Environmental Chemistry
 - Parallel Ocean Modeling
 - Global Climate Modeling
 - Computational Aeroscience
 - Massively Parallel Atmospheric Modeling
 - Groundwater Transport & Remediation
 - Computational Structural Biology
 - Quantum Chromodynamics
 - Molecular Dynamics Modeling



National Challenge Applications

- Digital Libraries
- Public Access to Government Information
- Electronic Commerce
- Education and Lifelong Learning
- Energy Management
- Environmental Monitoring
- Health Care
- Manufacturing Processes and Products

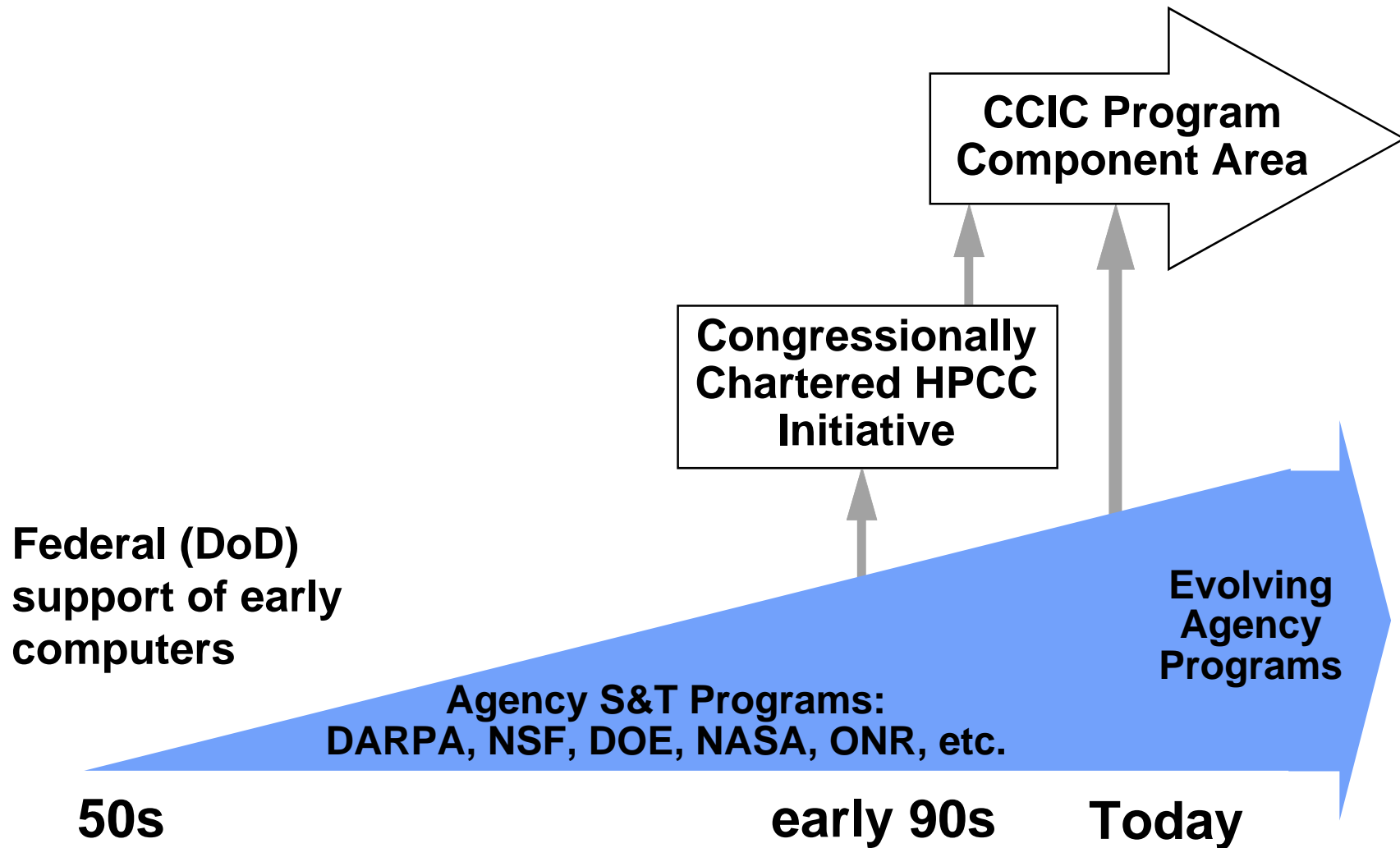


Federal HPCC Program has Evolved

- **National Research Council Brooks/Sutherland Report (1995) - a catalyst**
 - **Continue strong federal program in information technology**
 - **Increase focus on communications and networking; emphasize scaling and distribution**
 - **Treat development of teraflop computers as a research direction rather than a destination**
- **Achieved goals of HPCC Congressional Initiative**
- **Administration did not seek Congressional authorization but wanted to continue a strong program as part of NSTC and agency programs**

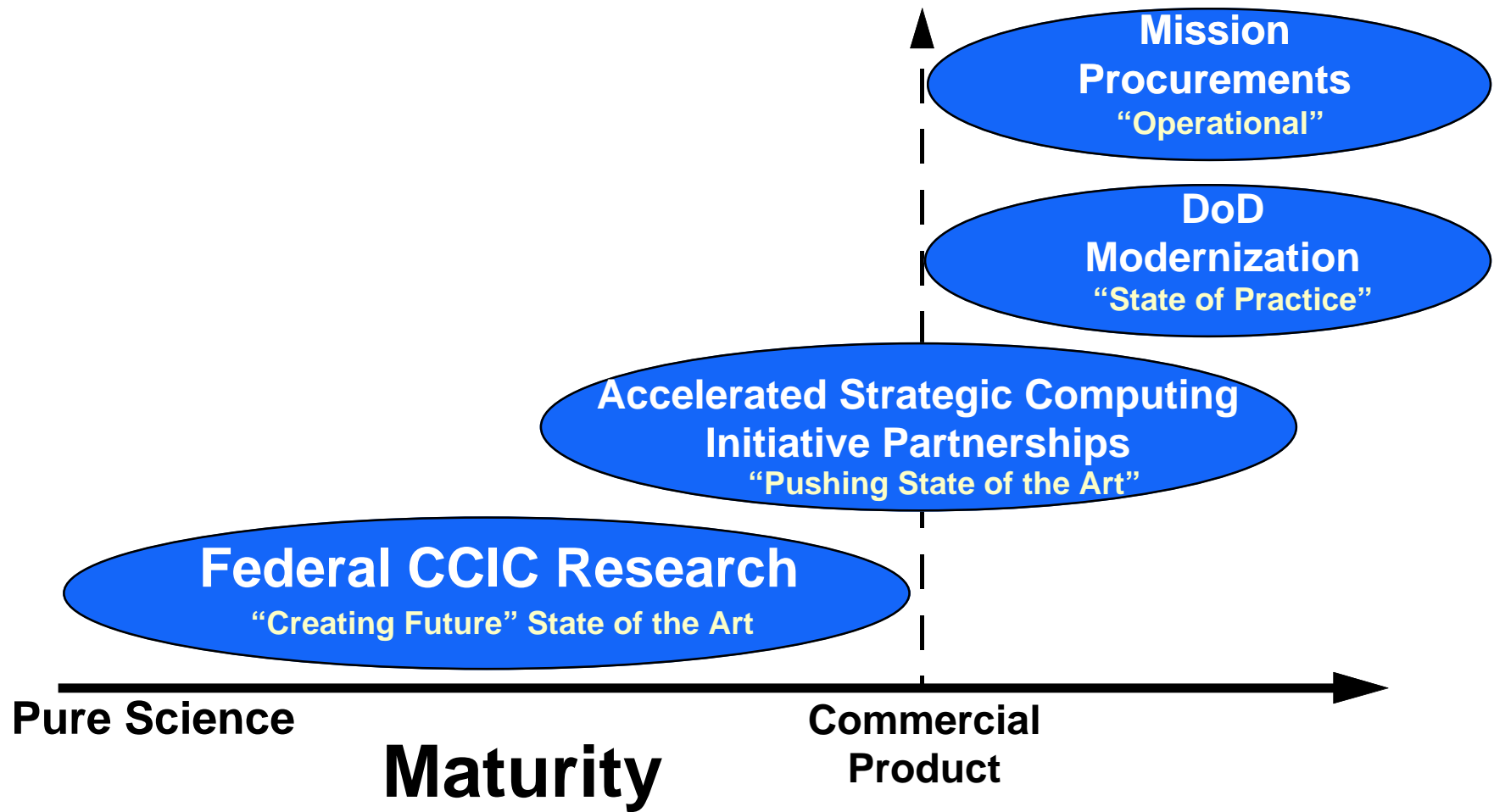


Long History of Federal Involvement in HPCC has Evolved and Grown Over Time





Related Federal Programs





Today's CCIC Interagency S&T Focus

- **Five Program Component Areas**
 - **High End Computing and Computation**
 - **Large Scale Networking**
 - **High Confidence Systems**
 - **Human Centered Systems**
 - **Education, Training, and Human Resources**

- **Each Area:**
 - **Spans multiple agencies/programs**
 - **Includes hardware, software, algorithms, & applications**



Challenges

- **To Federal Government:**
 - **Ensure that the U.S. asserts Information Technology leadership in science, technology development, and applications to achieve national goals**

- **To Advisory Committee:**
 - **Understand important Interagency S&T programs**
 - **Focus on the long term (10, 20 30 years out)**
 - **Pick a few topics (e.g. Next Generation Internet)**
 - **Advise the President and his Science Advisor how to ensure world leadership in Information Technology**